

## CLAIMS

What is claimed is:

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- 1 1. A method for managing changes in a computer system, the method  
2 comprising the steps of:  
3 storing, in a storage space, undo information for removing changes that are  
4 being made by a plurality of entities, wherein the undo information  
5 for each entity of the plurality of entities is stored in a segment of a  
6 plurality of segments within said storage space;  
7 monitoring usage of the storage space by the entities; and  
8 automatically adjusting at least one of the number of segments in the  
9 plurality of segments and the sizes of the plurality of segments based  
10 on the usage.
- 1 2. The method of Claim 1, said step of storing undo information comprising  
2 associating each entity with a segment for storing the undo information of the entity  
3 based on the usage.
- 1 3. The method of Claim 1, further comprising the steps of:  
2 establishing a maximum amount of the storage space; and  
3 preventing a sum of the sizes of the plurality of segments from exceeding  
4 the maximum amount of the storage space.
- 1 4. The method of Claim 1, said step of monitoring usage further comprising  
2 the step of monitoring usage in each period of time for a series of periods of time.

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1 5. The method of Claim 4, said step of automatically adjusting the plurality of  
2 segments further comprising the steps of:  
3 determining whether usage has decreased over a predetermined time based  
4 at least in part on the usage in one or more periods of time of the  
5 series of periods of time; and  
6 if usage has decreased over the predetermined time, then shrinking a sum of  
7 the sizes of the plurality of segments.

1 6. The method of Claim 5, said shrinking including deleting a segment from  
2 the plurality of segments.

1 7. The method of Claim 4, said step of automatically adjusting the plurality of  
2 segments further comprising the steps of:  
3 determining whether usage has decreased over a predetermined time based  
4 at least in part on the usage in one or more periods of time of the  
5 series of periods of time; and  
6 if usage has decreased over the predetermined time, then  
7 determining whether a first amount of storage space allocated to a first  
8 segment of the plurality of segments is being used by a first entity  
9 storing undo information in the first segment, and  
10 if the first amount is not being used by the first entity, then de-allocating the  
11 first amount from the first segment.



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- 1 12. The method of Claim 1, said step of storing undo information further  
2 comprising the steps of:  
3 determining whether a first segment of the plurality of segments is not  
4 storing undo information for the plurality of entities; and  
5 if the first segment is not storing the undo information for the plurality of  
6 entities, storing undo information for a new entity in the first  
7 segment.
- 1 13. The method of Claim 1, said step of automatically allocating the resource  
2 further comprising:  
3 determining based on the usage whether a first amount of the resource  
4 allocated to a first segment is not currently used by the plurality of  
5 entities; and  
6 if the first amount is not currently used, associating a new entity with the  
7 first amount of the resource.
- 1 14. The method of Claim 1, wherein:  
2 a first entity of the plurality of entities is associated with a first segment of  
3 the plurality of segments; and  
4 said step of automatically adjusting the plurality of segments further  
5 comprises increasing a size of the first segment in response to a  
6 request from the first entity by allocating an additional amount of the  
7 storage space to the first segment.

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1 15. The method of Claim 14, said step of automatically adjusting the plurality of  
2 segments further comprising:

3 determining whether sufficient storage space is already allocated to the first  
4 segment for storing undo information included in the request from  
5 the first entity; and

6 if it is determined that sufficient storage space is not already allocated to the  
7 first segment, then performing said step of increasing the size of the  
8 first segment.

1 16. The method of Claim 15, wherein a sum of the additional amount and the  
2 storage space already allocated to the first segment is sufficient for storing the undo  
3 information included in the request from the first entity.

1 17. The method of Claim 15, wherein the additional amount is based on the  
2 storage space already allocated to the first segment.

1 18. The method of Claim 14, wherein the additional amount is selected from a  
2 plurality of predetermined amounts.

1 19. The method of Claim 14, said step of allocating the additional amount  
2 further comprising:

3 determining whether the additional amount of the storage space is available  
4 in storage space not currently allocated to the plurality of segments;  
5 and





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1 27. A method for managing changes in a computer system, the method  
2 comprising the steps of:  
3 storing, in a storage space, undo information for removing changes that are  
4 being made by a plurality of entities, wherein the undo information  
5 for each entity of the plurality of entities is stored in a segment of a  
6 plurality of segments within said storage space, and a first entity of  
7 the plurality of entities is associated with a first segment of the  
8 plurality of segments, and a set of one or more entities of the  
9 plurality of entities is alone associated with a second segment of the  
10 plurality of segments;  
11 monitoring usage of the storage space by the entities in each period of time  
12 for a series of periods of time; and  
13 automatically adjusting at least one of the number of segments in the  
14 plurality of segments and the sizes of the plurality of segments based  
15 on the usage, said step of automatically adjusting comprising:  
16 determining whether usage has decreased over a predetermined time  
17 based at least in part on the usage in one or more periods of  
18 time of the series of periods of time;  
19 if usage has decreased over the predetermined time, then shrinking a  
20 sum of the sizes of the plurality of segments;  
21 determining whether sufficient storage space is already allocated to  
22 the first segment for storing undo information included in a  
23 request from the first entity; and



if it is determined that sufficient storage space is not already  
allocated to the first segment, then increasing the size of the  
first segment by allocating an additional amount of the  
storage space to the first segment, said step of allocating the  
additional amount comprising,  
determining whether the additional amount of the storage  
space is available in storage space not currently  
allocated to the plurality of segments, and  
if the additional amount of the storage space is available in  
storage space not currently allocated to the plurality  
of segments, then obtaining the additional amount of  
storage space from the storage space not currently  
allocated; and



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9 automatically adjusting at least one of the number of segments in the  
10 plurality of segments and the sizes of the plurality of segments based  
11 on the usage.

1 29. The computer-readable memory of Claim 28, said step of storing undo  
2 information comprising associating each entity with a segment for storing the undo  
3 information of the entity based on the usage.

1 30. The computer-readable memory of Claim 28, the instructions further  
2 causing the one or more processors to perform the steps of:  
3 establishing a maximum amount of the storage space; and  
4 preventing a sum of the sizes of the plurality of segments from exceeding  
5 the maximum amount of the storage space.

1 31. The computer-readable memory of Claim 28, said step of monitoring usage  
2 further comprising the step of monitoring usage in each period of time for a series  
3 of periods of time.

1 32. The computer-readable memory of Claim 31, said step of automatically  
2 adjusting the plurality of segments further comprising the steps of:  
3 determining whether usage has decreased over a predetermined time based  
4 at least in part on the usage in one or more periods of time of the  
5 series of periods of time; and  
6 if usage has decreased over the predetermined time, then shrinking a sum of  
7 the sizes of the plurality of segments.

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1 33. The computer-readable memory of Claim 32, said shrinking including  
2 deleting a segment from the plurality of segments.

1 34. The computer-readable memory of Claim 31, said step of automatically  
2 adjusting the plurality of segments further comprising the steps of:

3 determining whether usage has decreased over a predetermined time based  
4 at least in part on the usage in one or more periods of time of the  
5 series of periods of time; and

6 if usage has decreased over the predetermined time, then

7 determining whether a first amount of storage space allocated to a  
8 first segment of the plurality of segments is being used by a  
9 first entity storing undo information in the first segment, and  
10 if the first amount is not being used by the first entity, then de-  
11 allocating the first amount from the first segment.

1 35. The computer-readable memory of Claim 34, said step of automatically  
2 adjusting the plurality of segments further comprising the steps of:

3 determining whether de-allocating the first amount leaves an amount  
4 allocated to the first segment that is less than a predetermined  
5 minimum amount; and

6 if de-allocating the first amount leaves less than the predetermined  
7 minimum amount, then deleting the first segment.



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1 40. The computer-readable memory of Claim 28, said step of automatically  
2 allocating the resource further comprising:  
3 determining based on the usage whether a first amount of the resource  
4 allocated to a first segment is not currently used by the plurality of  
5 entities; and  
6 if the first amount is not currently used, associating a new entity with the  
7 first amount of the resource.

1 41. The computer-readable memory of Claim 28, wherein:  
2 a first entity of the plurality of entities is associated with a first segment of  
3 the plurality of segments; and  
4 said step of automatically adjusting the plurality of segments further  
5 comprises increasing a size of the first segment in response to a  
6 request from the first entity by allocating an additional amount of the  
7 storage space to the first segment.

1 42. The computer-readable memory of Claim 41, said step of automatically  
2 adjusting the plurality of segments further comprising:  
3 determining whether sufficient storage space is already allocated to the first  
4 segment for storing undo information included in the request from  
5 the first entity; and  
6 if it is determined that sufficient storage space is not already allocated to the  
7 first segment, then performing said step of increasing the size of the  
8 first segment.

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1 43. The computer-readable memory of Claim 42, wherein a sum of the  
2 additional amount and the storage space already allocated to the first segment is  
3 sufficient for storing the undo information included in the request from the first  
4 entity.

1 44. The computer-readable memory of Claim 42, wherein the additional amount  
2 is based on the storage space already allocated to the first segment.

1 45. The computer-readable memory of Claim 41, wherein the additional amount  
2 is selected from a plurality of predetermined amounts.

1 46. The computer-readable memory of Claim 41, said step of allocating the  
2 additional amount further comprising:  
3 determining whether the additional amount of the storage space is available  
4 in storage space not currently allocated to the plurality of segments;  
5 and  
6 if the additional amount of the storage space is available in storage space not  
7 currently allocated to the plurality of segments, then obtaining the  
8 additional amount of storage space from the storage space not  
9 currently allocated.

1 47. The computer-readable memory of Claim 41, wherein:  
2 a set of one or more entities of the plurality of entities is alone associated  
3 with a second segment of the plurality of segments; and  
4 said step of allocating the additional amount further comprises:

5 determining whether the additional amount of the storage space is  
6 currently allocated to the second segment of the plurality of  
7 segments and is not used by the set of one or more entities;  
8 and  
9 if the additional amount of the storage space is currently allocated to  
10 the second segment and is not used by the set, then obtaining  
11 the additional amount of storage space by de-allocating from  
12 the second segment the storage space currently allocated to  
13 the second segment and not used by the set.

1 48. The computer-readable memory of Claim 31, said step of monitoring usage  
2 in each period of time further comprising the step of monitoring an amount of the  
3 undo information stored in each period of time.

1 49. The computer-readable memory of Claim 31, said step of monitoring usage  
2 in each period of time further comprising the step of monitoring a number of  
3 entities started in each period of time.

1 50. The computer-readable memory of Claim 31, said step of monitoring usage  
2 in each period of time further comprising the step of monitoring a maximum  
3 number of entities executing concurrently in each period of time.



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1 51. The computer-readable memory of Claim 31, said step of monitoring usage  
2 in each period of time further comprising the step of monitoring a maximum  
3 duration in each period of time among durations of queries terminating during the  
4 period of time, said queries using at least some of the undo information stored in the  
5 storage space.

1 52. The computer-readable memory of Claim 41, wherein the additional amount  
2 is an extent of contiguous storage space.

1 53. The computer-readable memory of Claim 28, the step of automatically  
2 adjusting the plurality of segments further comprising the steps of:  
3 allocating unused amounts of the storage space to the plurality of segments  
4 in response to receiving undo information from the plurality of  
5 entities; and  
6 de-allocating unused amounts of the storage space from the plurality of  
7 segments periodically.